HELIX: The High Energy Light Isotope Experiment [Regents of the University of Michigan]Co-I

Completed Technology Project (2015 - 2020)

Project Introduction

This is a Co-I submission for a new suborbital program with Lead Institution University of Chicago and Lead PI Scott Wakely, HELIX (High-Energy Light Isotope eXperiment), designed to make measurements of the isotopic composition of light cosmic ray nuclei from ~200 MeV/nuc to ~10 GeV/nuc. Past measurements of this kind have provided profound insights into the nature and origin of cosmic rays, revealing, for instance, information on acceleration and confinement time scales, and exposing some conspicuous discrepancies between solar and cosmic-ray abundances. The most detailed information currently available comes from the ACE/CRIS mission, but is restricted to energies below a few 100 MeV/nuc. HELIX aims at extending this energy range by over an order of magnitude, to energies where, in many cases, no measurements of any kind exist. The HELIX measurements will provide essential information for understanding the propagation history of cosmic rays in the galaxy. This is a crucial element for properly interpreting several intriguing anomalies reported in recent cosmic-ray measurements, pertaining to the energy spectra of protons, helium, and heavier nuclei, and perhaps most strikingly, to the anomalous rise in the positron fraction at higher energy. HELIX employs a high-precision magnet spectrometer to provide measurements which are not achievable by any current or proposed instrument. The detector system will incorporate the existing superconducting magnet constructed for the HEAT payload, which has successfully operated on five previous high-altitude campaigns. This magnet will be combined with state-of-the-art detectors to measure the charge, time-of-flight, magnetic rigidity, and velocity of cosmic-ray particles with high precision. Specifically, the instrument will combine plastic scintillators, a silicon-strip tracker with ~30 micron spatial resolution, a high-performance drift chamber, and a ring-imaging Cherenkov counter employing aerogel radiators.

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Astrophysics Research and Analysis

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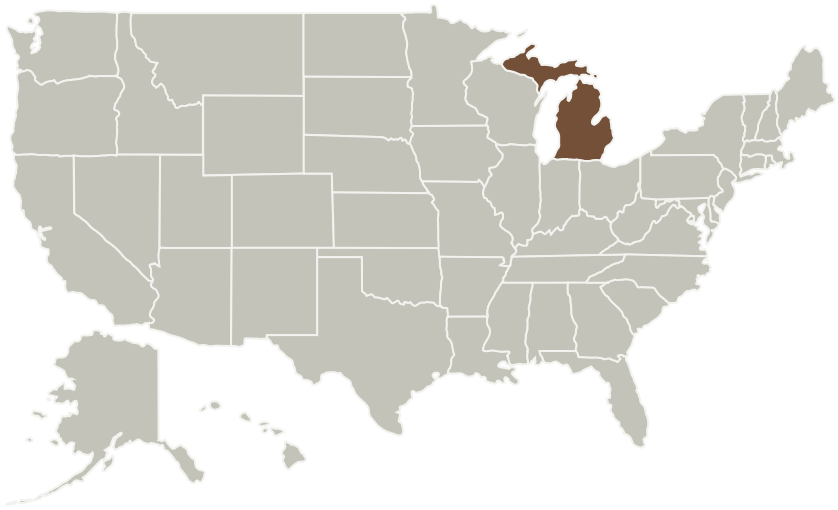
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
University of Michigan-Ann Arbor	Supporting Organization	Academia	Ann Arbor, Michigan

Primary U.S. Work Locations
Michigan

Project Management

Program Director:
Michael A Garcia

Program Manager:
Dominic J Benford

Principal Investigator:
Gregory Tarle

Co-Investigator:
Tracy M Mausolf

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destination

Outside the Solar System